

CLAIMS

What is claimed is:

1. An animal behavior analysis system, said system comprising:
an enclosure, said enclosure comprising:
5 an animal position indicator;
 a food consumption indicator; and
 a fluid consumption indicator,
wherein said system reports behavioral data at a temporal resolution
of 20 seconds or lower.
- 10 2. The system of claim 1, wherein said system reports behavioral data
with a temporal resolution of 1 second or lower.
3. The system of claim 1, wherein said system reports behavioral data
with a temporal resolution of 50 ms or lower.
4. The system of claim 1, wherein said enclosure is a mouse cage.
- 15 5. The system of claim 1, wherein said system reports behavioral data
with a temporal resolution sufficient to permit automated bout detection of a mouse.
6. The system of claim 1, wherein said animal position indicator
comprises a force plate.
7. The system of claim 6, wherein said force plate is a two-dimensional
20 force plate.
8. The system of claim 7, wherein said force plate comprises high and
low frequency transducers.
9. The system of claim 1, wherein said animal position indicator
comprises a video camera.

10. The system of claim 43, wherein said animal position indicator comprises an image acquisition system.

11. The system of claim 1, wherein said animal position indicator comprises a photobeam.

5 12. The system of claim 1, wherein said food consumption indicator comprises a conductance detector.

13. The system of claim 1, wherein said food consumption indicator comprises a capacitance detector.

10 14. The system of claim 1, wherein said food consumption indicator comprises a photobeam.

15. The system of claim 14, wherein said food consumption indicator comprises an overflow to prevent piled up food from producing a false positive signal.

16. The system of claim 1, wherein said fluid consumption indicator comprises a conductance detector.

15 17. The system of claim 1, wherein said fluid consumption indicator comprises a photobeam.

18. The system of claim 1, wherein said fluid consumption indicator comprises a capacitance detector.

20 19. The system of claim 18, wherein said capacitance detector operates in a radio frequency range.

20. The system of claim 1, wherein:
said animal position indicator comprises a two-dimensional force plate;
said food consumption indicator comprises a photobeam and an
25 overflow; and
said a fluid consumption indicator comprises a capacitance indicator.

21. The system of claim 20, further comprising a data acquisition system.

22. The system of claim 20, wherein said data acquisition system produces an event file.

23. The system of claim 22, wherein the event file produced by said
5 system provides event information at sufficient resolution to distinguish behavioral bouts of mice using a mathematical method.

24. The system of claim 23, wherein said mathematical method comprises a frequency analysis.

25. A method of characterizing the behavior of an animal, said method
10 comprising:

providing an animal in an animal behavior analysis system of claim
1; and

collecting data produced by said system wherein data provided by
said system comprises event information regarding spatial position of the animal in the
15 enclosure, event information regarding food consumption, and event information regarding fluid consumption.

26. The method of claim 25, wherein said animal is a mouse.

27. The method of claim 25, wherein said method further comprises
analyzing said data to provide a behavioral fingerprint of said animal.

28. The method of claim 27, wherein said analyzing comprises
20 automated detection of one or more behavioral bouts.

29. The method of claim 27, wherein said behavioral fingerprint is
characteristic for a particular genetic strain of said animal.

30. The method of claim 25, wherein said data is provided in an event
25 file.

31. The method of claim 25, further comprising taking a moving average of said event data.

32. The method of claim 25, further comprising performing a frequency analysis of said event data.

5 33. The method of claim 27, further comprising entering said fingerprint into a database of behavioral fingerprints.

34. An animal enclosure comprising a two dimensional force plate that identifies the position of an animal deposited thereon to an accuracy of at least ± 1 cm and that reports said position at a temporal resolution of at least 20 seconds or better.

10 35. The enclosure of claim 34, wherein said force plates reports said position with a temporal resolution of 1 second or lower.

36. The enclosure of claim 34, wherein said force plates reports said position with a temporal resolution of 50 ms or lower.

15 37. The enclosure of claim 34, wherein said force plates reports said position with a temporal resolution sufficient to permit automated bout detection of a mouse

38. The enclosure of claim 34, wherein said enclosure is a mouse cage.

39. The enclosure of claim 34, wherein said force plate comprises high and low frequency transducers.

20 40. A food consumption indicator, said food consumption indicator comprising a photobeam and an overflow to prevent piled up food from producing a false positive signal.

41. A fluid consumption indicator for a mouse, said fluid consumption indicator comprising a capacitance detector.

25 42. The fluid consumption indicator of claim 41, wherein said capacitance detector operates in a radio frequency range.

43. A method of characterizing animal behavioral data, said method comprising:

collecting animal behavioral data at a temporal resolution of less than about 20 seconds; and

5 analyzing said data using a mathematical method to identify a behavioral fingerprint.

44. The method of claim 43, wherein said collecting is performed with an animal behavior analysis system of claim 1.

45. The method of claim 43, wherein said animal behavior data
10 comprises data about animal position.

46. The method of claim 45, wherein said animal behavior data comprises data about eating and drinking events.

47. The method of claim 43, wherein said data is collected with a temporal resolution of 1 second or lower.

15 48. The method of claim 43, wherein said data is collected with a temporal resolution of 50 ms or lower.

49. The method of claim 43, wherein said animal is a mouse.

50. The method of claim 43, wherein said animal is a knockout mouse.

51. The method of claim 43, wherein said behavioral fingerprint
20 comprises a plurality of behavioral bouts.

52. The method of claim 43, wherein said method further comprises entering said behavioral fingerprint into a database of behavioral fingerprints.

53. The method of claim 43, wherein said collecting produces an event file.

54. The method of claim 43, wherein, wherein the event file produced by said system provides event information at sufficient resolution to distinguish behavioral bouts of mice.

55. The method of claim 43, wherein, wherein said mathematical method
5 comprises a frequency analysis.

56. The method of claim 43, wherein, wherein said mathematical method comprises a moving average.

57. A method of characterizing animal behavioral data, said method comprising:
10 providing animal behavioral data comprising information about animal position and
analyzing said data using a mathematical method to identify a behavioral fingerprint.

58. The method of claim 42, wherein said animal behavior data
15 comprises data about animal position.

59. The method of claim 57, wherein said animal behavior data comprises data about eating and drinking events.

60. The method of claim 57, wherein said data is collected with a temporal resolution of 1 second or lower.

20 61. The method of claim 57, wherein said data is collected with a temporal resolution of 50 ms or lower.

62. The method of claim 57, wherein said animal is a mouse.

63. The method of claim 57, wherein said animal is a knockout mouse.

64. The method of claim 57, wherein said behavioral fingerprint
25 comprises a plurality of behavioral bouts.

65. The method of claim 57, wherein said method further comprises entering said behavioral fingerprint into a database of behavioral fingerprints.

66. The method of claim 57, wherein said collecting produces an event file.

5 67. The method of claim 57, wherein, wherein the event file produced by said system provides event information at sufficient resolution to distinguish behavioral bouts of mice.

68. The method of claim 57, wherein, wherein said mathematical method comprises a frequency analysis.

10 69. The method of claim 57, wherein, wherein said mathematical method comprises a moving average.

70. A database comprising computer readable media said media containing a plurality of behavioral fingerprints for one or more species of animal.

15 71. The database of claim 70, wherein said behavioral finger prints comprise information regarding animal position in a test enclosure.

72. The database of claim 70, wherein said behavioral finger prints comprise information regarding animal feeding.

73. The database of claim 70, wherein said behavioral finger prints comprise information regarding animal drinking.

20 74. The database of claim 70, wherein said behavioral finger prints comprise information regarding animal sleeping.

75. The database of claim 70, wherein said behavioral finger prints comprise information regarding animal foraging patterns.

25 76. The database of claim 70, wherein said fingerprints are characteristic of particular strains of said animal.

77. The database of claim 70, wherein each of said fingerprints comprise information regarding a plurality of behavioral bouts.

78. A method of screening an agent for an effect on animal behavior, said method comprising:

- 5 contacting a test animal with said agent;
 placing said animal in an animal behavior analysis system of claim 1
to generate a behavioral fingerprint;
 and comparing said finger print to a negative control fingerprint
where a deviation of said fingerprint from said negative control indicates that said agent
10 alters said animal's behavior.

79. The method of claim 78, wherein said agent is a substance of abuse.

80. The method of claim 78, wherein said agent is a pharmaceutical.

81. The method of claim 78, wherein said animal is a mouse.

82. The method of claim 78, wherein said animal is a mutant mouse..

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